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Assessment of Tsunami Preparedness in East Coast of India through Mega Mock Tsunami Drill conducted on 24 November 2017

by

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Abstract (100 words)

Though tsunamis are infrequent, the death toll from tsunamis is huge compared with other natural disasters. The 26 December 2004 Indian Ocean tsunami resulted in disastrous loss of life and property. The major challenge with tsunamis is that they are infrequent, which requires great persistence in sustaining the process of capacity building and preparedness. Because of this infrequency, instruction through tsunami mock drills is the best way to train coastal communities to prepare for devastating actual events. The situational awareness and ability to respond quickly is best achieved through pre-event education and mock drills. The Tsunami mock drills evaluates the ability of warning centre and disaster offices to respond to a tsunami. The drills also educate the public on: where they would receive the official warnings, by which means, what those warnings indicate, how to understand them, and what they need to do in response.

INCOIS in collaboration with MHA and NDMA has conducted mega mock tsunami mock drill on 24 November, 2017 to East coast of India. Disaster Management Organisations of Andhra Pradesh, Odisha, Puducherry, Tamil Nadu and West Bengal participated in the drill. They took the drill to community level and executed evacuations at different villages. The average elapsed time achieved from time of receipt of warning to activating the public notification systems was 30 minutes. This is great achievement compared with previous mock drills as it has substantially improved, though the involvement of communities was at huge level. The Tsunami mock drill was very successful which enhanced the awareness and preparedness among the coastal people of East Coast of India.

Contents

1. Introduction

Natural disasters are a common phenomenon in India but occur most often along the country's coastal region. Most of the states are categorized as multi-hazardous and the 8,000 km long coastline is exposed to tropical cyclones, tsunamis, storms and floods. Though tsunamis are not frequent, they are significant natural hazards that can cause great destruction and loss of life within minutes on shores near and far. Although Indians have been subject to significant tsunamis in the past (e.g., 1881, 1883 and 1945), we were unaware of the word 'tsunami' until 2004 Boxing Day tsunami in the Indian Ocean which has significantly increased public awareness of tsunami risk in India.

Although it is evident that India was hit by tsunamis earlier, the calm period over several centuries in east coast of India and few decades in west coast of India created a fugue state, which erased memories of destruction caused by these tsunamis. However, it is clear that the 2004 Indian Ocean tsunami resulted in catastrophic losses of life and property. It demonstrated how destructive the tsunamis can be. More than 2,30,000 people lost their lives in the Indian Ocean rim countries. Waves, many meters in height destroyed everything that was in its path and caused around 1.8 million people homeless. In India, the tsunami took away nearly 16,000 lives and caused huge damage to the property. The reason for such a great loss to lives and property is due to lack of awareness and preparedness to tsunamis.

In response to the devastating tsunami, with a motive to avoid future losses and to build tsunami resilient communities along the coastal states, the Government of India established the Indian Tsunami Early Warning System (ITEWS) at Indian National Centre for Ocean Information Services (INCOIS), Hyderabad under the Ministry of Earth Sciences. The 24x7 tsunami warning centre is operational since October, 2007 and has all necessary computational and communication infrastructure that enables reception of real-time data from wide range of sensors, analysis of the data, generation and dissemination of tsunami advisories following unique Standard Operating Procedure (SOP).

The characteristics of tsunami such as fast-onset and unpredictability regarding when and where the next tsunami will hit, make it unique from other natural hazards. However, when it does happen, it impacts in severe way with little notice and therefore little time to respond. This puts a tremendous responsibility on countries like India where 26% of population live within 100 km from the shoreline, to prepare ahead of time through planning, development of agreed-upon Standard Operating Procedures and practice through drills.

To develop effective risk management measures, it is crucial that our level of experience at individual, community and national levels in dealing with significant tsunami needs to be better understood. The benefits of a better understanding of tsunami risk are found in increased support for risk reduction activities, increased readiness and response capability and an understanding of how to recover from such events in an efficient manner. By building these capabilities we will not only reduce loss of lives but the economic exposure to future

tsunami and other natural hazards. While a tsunami cannot be prevented, its impact can be mitigated through community and emergency preparedness, timely warnings, effective response, and public education. The Tsunami drills will evaluate the ability of warning centre and national/state/local disaster offices to respond to a tsunami. The drills not only emphasize the testing of communications from warning centre to its stakeholders, but also provide an opportunity for testing national/state/local chains of command and decision-making, including the alerting and evacuation of people from selected coastal communities. They also provide a prospect to promote emergency response plans and tsunami preparedness.

As part of improving awareness and preparedness of the administration and the general public, Ministry of Home Affairs (MHA) intended to conduct tsunami mock drill to the coastal states of India. In this regard, National Disaster Management Authority (NDMA) in collaboration with Indian Tsunami Early Warning Centre (ITEWC), INCOIS conducted a tsunami mock drill on November 24, 2017 to the east coast states of India.

The mega-mock tsunami drill was a huge success with active participation of all Disaster Management Organisations (DMOs) of Andhra Pradesh, Odisha, Puducherry, Tamil Nadu and West Bengal. During the drill INCOIS issued tsunami bulletins for test scenario simulating a tsunami triggered by an earthquake near Nicobar Islands and Notification Messages were disseminated to pre-designated points of contact (disaster management officials of east coast of India) through E-mail, SMS & Fax.

In preparation to the tsunami mock drill INCOIS organized a tsunami Standard Operating Procedure (SOP) workshop on November 8, 2017 at INCOIS, Hyderabad for the disaster management authorities, NDRF battalions, Indian Navy and Coast guards of east coast states. A total of 55 members from DMOs, NDRF, Indian Navy, and Coast Guard participated in the workshop. Tabletop exercise was also conducted to familiarize them with tsunami bulletins and coordination mechanism with other DMOs and line departments.

Figure-1: Tsunami SOP Workshop at INCOIS on November 8, 2017

Further, to the workshop conducted at INCOIS, NDMA also conducted sensitization workshops at all coastal states. Also, Andhra Pradesh state has conducted a tsunami sensitization workshop in collaboration with INCOIS at their field level prior to the mock drill.

2. Objectives

i. Validate the Warning Centre dissemination process for issuing Tsunami Bulletins to various disaster management organizations and other participating agencies.

ii. Evaluate the processes and procedures of agencies receiving and confirming Tsunami Bulletins.

iii. Hone the organizational decision making process about public warnings and evacuation.

iv. Identify proper communication methods that would be useful to notify and instruct the public.

v. Record and assess the elapsed time until the public would be notified and instructed

vi. Validate the level of community awareness, preparedness and response

3. Mock drill Scenario details

Magnitude	:	9.2 Mw
Latitude	:	7.2 N
Longitude	:	92.9 E
Depth	:	10 km
Origin Time	:	0930 IST (0400 UTC)
Date	:	November 24, 2017
Region	:	Nicobar Islands, India

a) The duration of the mock tsunami drill was 4 hours i.e., from 0930 to 1330 IST.

b) The scenario replicated a major earthquake near Nicobar Islands, India that can generate a devastating Tsunami affecting east coast of India within 2 - 2.5 hours from the occurrence of earthquake at 0930 IST.

c) Indian Tsunami Early Warning Centre (ITEWC), INCOIS, Hyderabad issued notification messages through Email, Fax, and SMS.

Detailed bulletins were placed at password protected INCOIS website to test the web-access during the drill. In order to avoid unnecessary panic, both the notification messages as well as the detailed bulletins were clearly marked with “TEST” header and footer marks.

Table-1: Tsunami Mock Drill Timeline on November 24, 2017

Date	Bulletin No.	Time (IST)	Bulletin Type	Detail
24-Nov-2017		0930	Earthquake	Test START UP Message
24-Nov-2017	1	0935	Type-I EQ Bulletin (8.8 M)	Qualitative Information on Tsunami Potential
24-Nov-2017	2	0940	Type-II EQ + Scenario Results (9.2 M)	(Quantitative Info on Tsunami Threat Status) WARNING for Andaman & Nicobar Islands and ALERT for, Tamil Nadu, Puducherry, Andhra Pradesh and Odisha
24-Nov-2017	3	0945	Type-III EQ + Scenario Results (9.2 M) + WL Obs	(Quantitative Info on Tsunami Threat Status - Updated) Confirmed tsunami Observation by Campbell Bay (India) Tide gauge and Updated WARNING for Andaman & Nicobar Islands, Andhra Pradesh, Tamil Nadu, Puducherry and Odisha, Alert for West Bengal
24-Nov-2017	4	1030	Type-III Supplementary 01	Additional water level observations at various tide gauges viz., Port Blair and STB01 (India).
24-Nov-2017	5	1130	Type-III Supplementary 02	Additional water level observations at various tide gauges viz., Sabang (Indonesia) and Aerial By (India)
24-Nov-2017	6	1230	Type-III Supplementary 03	Additional water level observations at various tide gauges viz., Chennai and Visakhapatnam (India).
24-Nov-2017	7	1330	Final Bulletin	Final Threat Passed Bulletin including all water level Observations from all tide gauges, viz., Campbell Bay, Port Blair, STB01, Sabang, Aerial Bay, Chennai, Vishakhapatnam, Paradip (India) and Male (Maldives).

4. The Mock Drill Description

The drill can be described as a functional style exercise that involved communication and decision-making at the higher level. The drill placed all States/Union Territories of east coast of India into hypothecated tsunami warning scenario similar to 2004 tsunami that would require all states to practice their emergency response decision making for arrival of a destructive tsunami waves, to take actions and test their Standard Operating Procedures prior to public notification.

The first stage of the drill involved a simulated scenario of a destructive tsunami across the Indian Ocean and issuance of tsunami bulletins by Indian Tsunami Early Warning Centre. The bulletin notification messages were disseminated through email, fax, web, SMS to designated national, state, district and other responsible emergency authorities for tsunami emergency response. To avoid any possible misinterpretation, bulletins issued by the warning centre were embedded with "TEST" header and footer messages.

The second stage involved national, state and local decision making and notification to the last level i.e. the public. Community involvement was the major objective of the mock drill which was achieved through active participation of different level of stakeholders such as field units, line departments and public etc. Giving high importance to the drill all 5 east coast States/Union Territories of India participated in the mega-mock tsunami drill and public were evacuated from several locations which include 9 districts in Andhra Pradesh, 6 districts in Odisha, 13 districts in Tamil Nadu, 1 district in Puducherry and 3 districts in West Bengal.

It was observed that all modes of last-mile communication systems such as SMS-based alerts, megaphones, public alert system, door-to-door alerting, etc were used by the local authorities to inform the possible tsunami threat to coastal population. The details of village level participation in the drill are given as Appendix-A. Summary of Feedbacks received from participated agencies is given as Appendix-F.

5. Post-Exercise Evaluation

5.1. Objective-1: ITEWC message dissemination

ITEWC issued the test messages in accordance with the test timeline, consisting of the test commencement message followed by 7 test notification messages to disaster management organisations of east coast of India via E-mail, Fax and SMS. In the mock drill, most DMOs agreed that notifications issued by the ITEWC were timely.

However, it was observed that during the mock drill, after dissemination of bulletins, ITEWC received many phone calls regarding inclusion of phone numbers and email ids from emergency authorities for reception of notification messages. Though it is difficult to make changes to the dissemination list during tsunami process, ITEWC had accepted

the requests and made changes, nevertheless it should be noted that this may not be possible during real tsunami case which is race against time.

Recommendations:

- State/District/Mandal/Block level DMOs contact list to be updated once in every six months
- INCOIS to regularly review and send its 24 x 7 Tsunami Early Warning Centre contact details to all stakeholders.
- Also it is recommended INCOIS to develop a mechanism for the regular review and update of the tsunami contacts online. The same can be provided to the stakeholders once in a while to check their details and update the information, if any discrepancy is found.

5.2. Objective-2: DMOs message reception and access of INCOIS website

Refer to Appendices B, C, D and E for the Email, Fax, SMS messages received and Web access by each national recipient, as reported in their Test Logs respectively. The results are based on feedbacks received from recipients.

5.2.1. Email reception:

ITEWC Email messages were received by most of the recipients. For most of the email notifications, the delay times are between 0 - 3 minutes and only a few messages were delayed longer than this. The maximum delay was 28 minutes for Notification Message-3 to Guntur District, Andhra Pradesh.

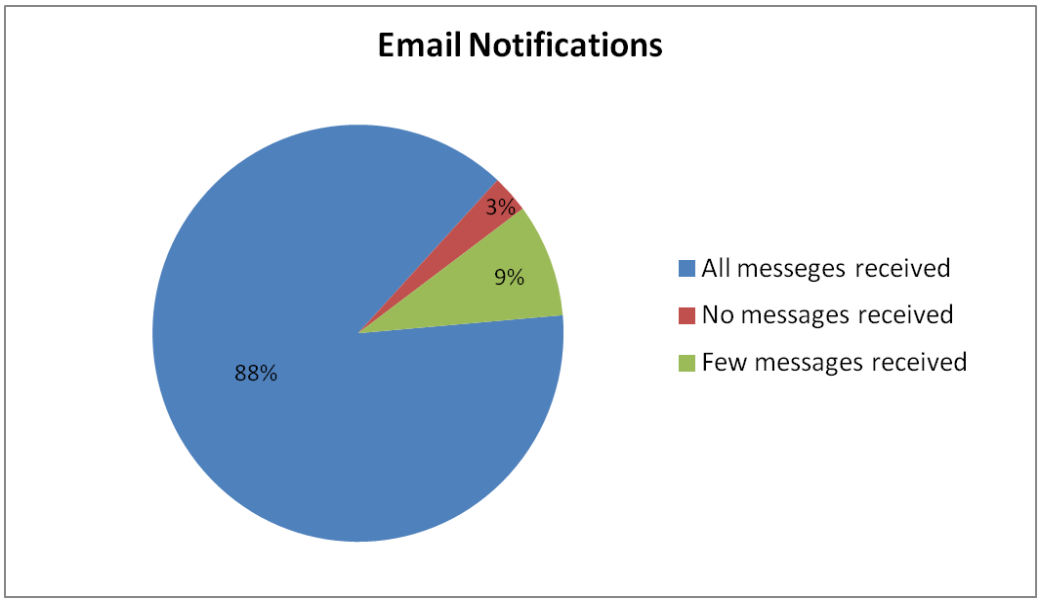

Figure-2: Status of Email notifications received

It was noted that North 24 Parganas District of West Bengal has not received any email notification from INCOIS, though the details provided by SEOC, West Bengal were added into dissemination list of INCOIS and the delivery status of the same shows that emails were delivered successfully. The SEOC, West Bengal needs to provide the contact details to ITEWC, so that they can be included in dissemination list.

5.2.2. Fax reception:

Feedback received from the participants shows that a very few participants received fax messages from ITEWC. For most of the fax messages, delay times are between 0 - 6 minutes and only a few messages were delayed longer than this. The maximum delay was 50 minutes for startup message to 4th Bn NDRF .

The following is the list of contacts who haven't received fax from ITEWC: East Godavari, Guntur, Krishna, Nellore, Srikakulam, Visakhapatnam, Vizianagaram, West Godavari districts and SEOC of Andhra Pradesh; Balasore, Bhadrak, Ganjam, Jagatsinghpur, Puri districts and SEOC of Odisha; North 24 Parganas, Purba Medinipur, South 24 Parganas districts of West Bengal; 3rd Bn NDRF and Coast Guards. However, ITEWC has included the fax numbers provided by above said authorities in its dissemination list and sent fax to all. The delivery status of each fax message will be verified individually and the same will be communicated with respective authority for confirmation and dissemination list will be updated if any discrepancy is found.

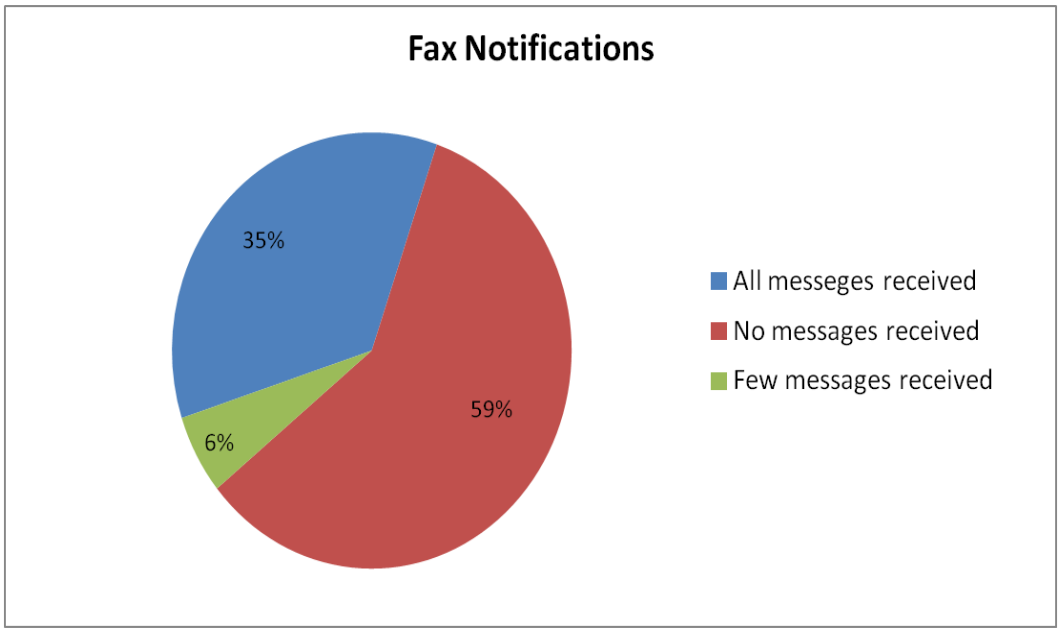

Figure - 3: Status of Fax notifications received

5.2.3. SMS reception:

The feedback shows that most of the participants received SMS. The observed delay for delivery of the most SMS messages is noted as 0 - 4 minutes and only a few messages delayed longer than this. The maximum delay was 46 minutes for notification message 2 to 4th Bn NDRF.

Guntur district of Andhra Pradesh; Balasore, Puri districts of Odisha; Cuddalore, Thoothukudi, Thiruvallur districts of Tamil Nadu and 3rd Bn NDRF reported that they haven't received any of the messages through SMS. The delivery status of each SMS message will be verified individually and the same will be communicated with respective authority for confirmation and dissemination list will be updated if any discrepancy is found.

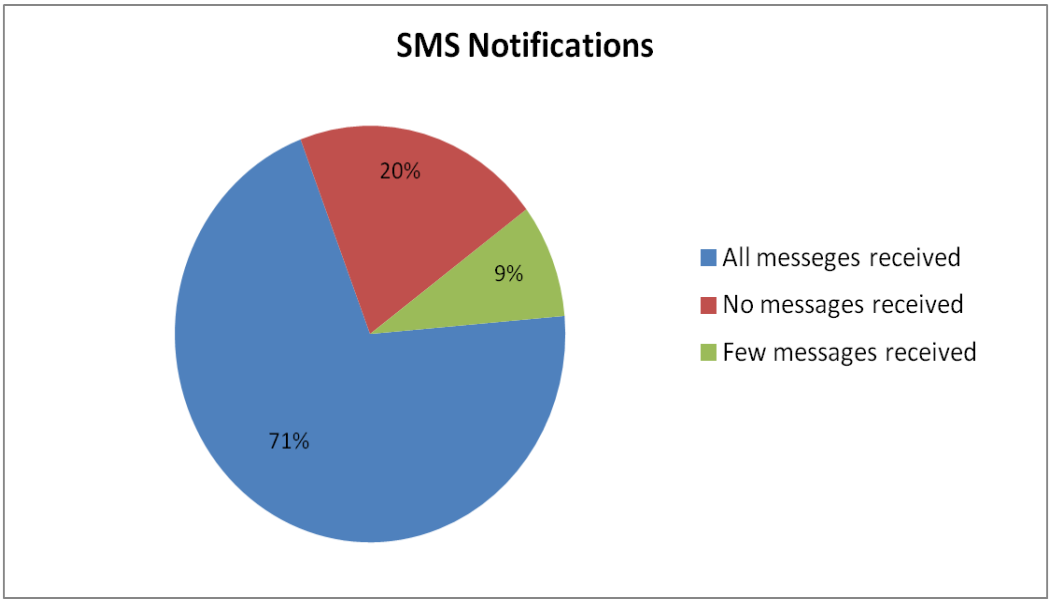

Figure - 4: Status of SMS notifications received

5.2.4. Web access

All recipients were able to access the ITEWC, INCOIS website after each of the test messages was disseminated.

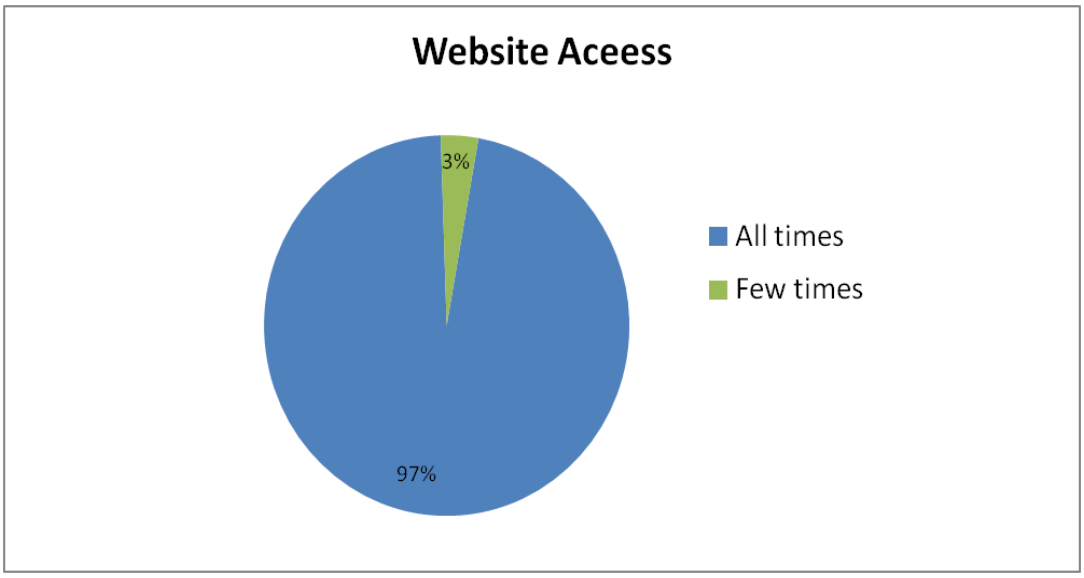

Figure - 5: Status of Web access during the drill

The feedback from the participants reveal that Email and SMS are the effective means of communication reaching more number of recipients with very less delay times. Web was accessible for all the bulletins during the drill.

Recommendations:

- The overall dissemination and reception process found to be satisfactory at DMOs. However the evaluation report from the feedbacks shows few issues such as contact information provided to the warning centre for reception of tsunami bulletins and the details provided on feedback forms is found to be different. Stakeholders to provide responsible agency/person contact information to which INCOIS has to send tsunami advisories.
- It was observed that though the dissemination status at INCOIS shows as successful, many agencies have reported no message has been received. The agencies are requested to provide the latest contact details of authorities to INCOIS.
- Though INCOIS is in constant touch with all stakeholders, it is also recommended that NDMA to provide at least state-level (SEOCs) contact information to INCOIS on regular basis
- However, ITEWC to investigate the non-receipt of messages to few DMOs and update the dissemination list with latest contact information.
- As it was found that the dissemination though Fax was very poor in performance, it is recommended to DMOs to establish dedicated Auto-Fax machine at each State/District Emergency operation centre for effective communication.

5.3. Objective-3: Process of decision making about public warnings and evacuation

All states of east coast of India took active participation in mock drill and most importantly the drill was taken up to the community level. All state disaster management authorities forwarded the tsunami advisories down to their concerned department. From the feedbacks received, the actions of DMOs after receiving tsunami advisories are listed below.

Table-2: Actions of DMOs after receiving Tsunami advisories

Sl No.	Location	Actions taken by DMOs after receiving messages
Andhra Pradesh		
1.	East Godavari	Message pass on to all line departments, NGOs, Local Public Alerted at 9:37AM
2.	Guntur	Message pass on to all line departments, Local Public Alerted at 09:46 AM
3.	Krishna	Message pass on to all line departments, Local ground level agencies Alerted at 09:46 AM
4.	Nellore	Alert the all line departments by beat of Tom-tom at 09:45 AM and Evacuated people at 10:00 AM
5.	Prakasam	Alerted the villagers at 9:38 AM
6.	Srikakulam	Messages communicated to local ground level agencies at 10:05 AM
7.	Visakhapatnam	Informed to all the offices and announcement has been done by beat of Tom Tom in the Village at 09:37 AM
8.	Vizianagaram	Messages forwarded line departments by 10:00 AM
9.	West Godavari	Alerted the line departments and public to watch and be prepared for evacuation at 09:46 AM
10.	SEOC	Disseminated information to all 9 coastal distracts
Odisha		
1.	Balasore	Disseminated messages to all line departments
2.	Bhadrak	Disseminated messages to all line departments
3.	Ganjam	Disseminated messages to all line departments
4.	Jagatsinghpur	Disseminated messages to all line departments
5.	Kedrapada	Disseminated messages to all line departments
6.	Puri	Disseminated messages to all line departments
7.	SEOC	Disseminated timely messages to all 6 coastal districts
Tamil Nadu		
1.	Cuddalore	Disseminated messages to all line departments and Hospitals/
2.	Kancheepuram	Disseminated messages to all line departments
3.	Kanniyakumari	Disseminated messages to all line departments
4.	Nagapattinam	Disseminated messages to all line departments
5.	Thoothukudi	Disseminated messages to all line departments
6.	Tirunelveli	Disseminated messages to all line departments
7.	Thiruvallur	Disseminated messages to all line departments

8.	Thiruvarur	Disseminated messages to all line departments
West Bengal		
1.	North 24 Parganas	Disseminated messages to all line departments
2.	Purba Medinipur	Disseminated messages to all line departments
3.	South 24 Parganas	Disseminated messages to all line departments
4.	SEOC	Disseminated messages to all coastal districts

Recommendations:

- Involvement of line departments, NGOs, Media and Welfare societies need to be improved
- Have local points of contact who are trained in emergency communication such as village volunteers in case of Odisha, for public warning messaging and public warning dissemination, emergency management and community preparedness.

5.4. Objective-4: Communication methods for public notification and instruction

Disaster management organisations in different states used different modes of communications to share the tsunami information and notify the public. Most of the participated organisations forwarded message to their line departments for further action. From the feedbacks received, the methods of communication used for notifying public are listed below.

Table-3: Method of communication used for notifying public

Sl No.	Location	Communication methods used for notify public
Andhra Pradesh		
1.	East Godavari	Telephone, SMS, Website, Sirens, PAS, Police, Door-to-door, Hand held mike and drum
2.	Guntur	Telephone, TV, PAS, Police, Door-to-door and Media
3.	Krishna	Telephone, SMS, TV, Website, Siren, PAS, Public call centre, Police, Door-to-door and Tom-Tom
4.	Nellore	Telephone, SMS, Public Radio, TV, Website, Siren, PAS, Public call centre, Police, Door-to-door and Tom-Tom
5.	Prakasam	Telephone, SMS, Public Radio, TV, Siren, PAS, Police, Door-to-door and Tom-Tom
6.	Srikakulam	Telephone, SMS, TV, Siren, PAS, Public call centre, Police, Door-to-door
7.	Visakhapatnam	Telephone, SMS, Siren, PAS, Police, Door-to-door and tom-tom
8.	Vizianagaram	SMS, TV, Website, Siren, PAS, Police and Door-to-door

9.	West Godavari	SMS, Siren, PAS, Police, Door-to-door and through mike sets from temples and churches
10.	SEOC	Telephone, SMS, TV, Siren, PAS, Public call centre, Police and Door-to-door
Odisha		
1.	Balasore	Telephone, SMS, Siren, PAS, Police, Door-to-door and village volunteers
2.	Bhadrak	-
3.	Ganjam	Telephone, SMS, TV, Website, Siren, PAS, Police and Door-to-door
4.	Jagatsinghpur	Siren, PAS, Police and Door-to-door
5.	Kedrapada	Telephone, SMS, Public Radio, Siren, PAS, Police and Door-to-door
6.	Puri	Telephone, SMS, Siren, PAS, Police, Door-to-door and village level volunteers
7.	SEOC	To District level by Email, Fax, SMS, Social media
Tamil Nadu		
1.	Cuddalore	Yes. By TV, PAS and public Radio
2.	Kancheepuram	Telephone, SMS, Public Radio, TV, Website, Siren, PAS, Public call centre, Police and Door-to-door
3.	Kanniyakumari	SMS, Public Radio, Siren, PAS, Police, Door-to-door, Whatapp groups, Fire service, Bells.
4.	Nagapattinam	Telephone SMS, Public Radio, Siren, PAS, Police, Door-to-door and Whatapp groups
5.	Thoothukudi	Siren, PAS, Police, Door-to-door and Whatapp groups
6.	Tirunelveli	Siren, PAS, Police, Door-to-door and Whatapp groups
7.	Thiruvallur	Sirens, PAS, Police and Door-to-door
8.	Thiruvarur	SMS, Siren, PAS, Police, Door-to-door and Whatapp groups
West Bengal		
1.	North 24 Parganas	Telephone, SMS, Public Radio, Siren, PAS, Police, Door-to-door and Wall writing
2.	Purba Medinipur	Telephone, SMS, Public Radio, Siren, PAS, Police and Door-to-door
3.	South 24 Parganas	Telephone, SMS, Public Radio, TV, Website, Siren, PAS, Police and Door-to-door
4.	SEOC	Telephone, SMS, Public Radio, TV, Website, Siren, PAS, Public call centre, Police and Door-to-door

It was observed that most of the organisations used different mode of communications like Telephone, SMS, Whatsapp, Twitter, Public radio, TV, website, Siren, Public Alert System, Police, Door-to-door, Fire service, Bells, Mega phone, VHF, village volunteers, etc. for their last mile connectivity.

Recommendations:

- Develop guidelines as, to what constitutes effective public outreach, make these guidelines publicly available, and regularly evaluate public outreach efforts.
- Effective dissemination of warnings involves multiple organizations using multiple channels to frequently deliver the same message to public. When the messages are immediately disseminated to the public via television, radio, and the Internet from the higher level authorities such as SEOCs or NEOC the ambiguity can be avoided at community level.
- Dedicated tsunami Siren systems to be installed in all tsunami vulnerable regions
- The communication network/infrastructure need to be improved to avoid communication gaps such as to have satellite based communication system in all EOCs as foolproof method in case of tsunami emergency.

5.5. Objective-5: Assessment of elapsed time for notifying public

The time taken for notifying the public after receiving messages from the tsunami warning centre are as summarized below. It was observed that the elapsed time has improved significantly, which shows the preparedness & awareness of people. From the feedbacks received, elapsed time for public notification is listed below.

Table-4: Elapsed Time for Public Notification and Instruction

Sl No.	Location	Making a decision on public warning (From time of receipt of warning) in minutes	Formulation/compilation of public Notification (From time of decision) in minutes	Activation of public notification systems (From time of notification formulated) in minutes	Total Time in minutes
Andhra Pradesh					
1.	East Godavari	2	2	2	6
2.	Guntur	1	5	10	15
3.	Krishna	10	26	25	60
4.	Nellore	2	5	10	17
5.	Prakasam	5	5	5	15
6.	Srikakulam	10	25	25	60

7.	Visakhapatnam	10	15	5	30
8.	Vizianagaram	2	5	2	10
9.	West Godavari	1	Nil	1	2
10.	SEOC	2	2	2	< 30
Odisha					
1.	Balasore	10	15	15	40
2.	Bhadrak	5	5	3	13
3.	Ganjam	5	10	12	27
4.	Jagatsinghpur	15	25	20	60
5.	Kedrapada	< 2	< 2	< 2	6
6.	Puri	10	15	15	40
7.	SEOC	5	5	10	20
Tamil Nadu					
1.	Cuddalore	-	-	-	-
2.	Kancheepuram	2	5	10	17
3.	Kanniyakumari	10	5	5	20
4.	Nagapattinam	15	30	30	75
5.	Thoothukudi	2	1	12	15
6.	Tirunelveli	5	5	5	15
7.	Thiruvallur	15	10	75	100
8.	Thiruvarur	5	4	5	14
West Bengal					
1.	North 24 Parganas	30	15	15	60
2.	Purba Medinipur	5	5	10	20
3.	South 24 Parganas	5	8	6	19
4.	SEOC	4	6	11	21

Response time is very important factor for disaster management, especially for tsunamis which have very fast onset. From the feedbacks, it was observed that East Godavari, Guntur, Prakasam, Vizianagaram, West Godavari of Andhra Pradesh; Bhadrak, Kedrapada of Odisha; Thoothukudi, Tirunelveli, Thiruvarur of Tamil Nadu were took very less time (15 minutes) to send notifications to public. Nagapattinam, Thiruvallur of Tamil Nadu took comparatively long time (75-100 minutes) to send notifications to public. And on an average, the elapsed time for public notification was 29 minutes. It is recommend to the DMOs SOP where elapsed time is exceeding more than 30 minutes to reduce time as much as possible, which helps the public to have more time for evacuation.

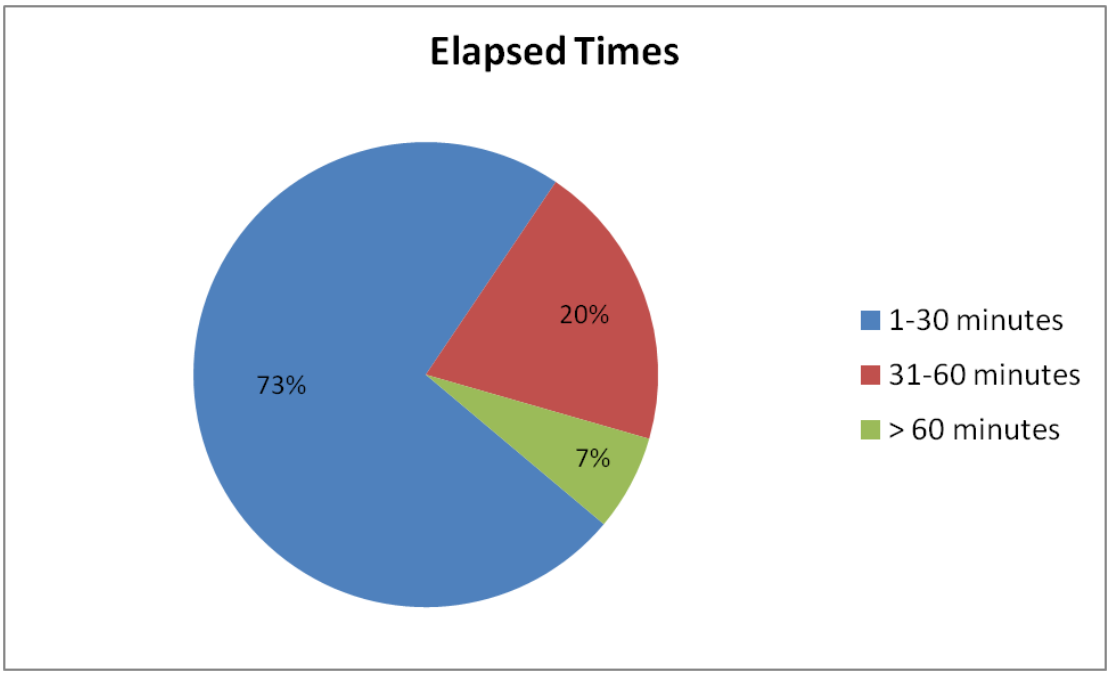

Figure - 6: Elapsed Time for Public Notification and Instruction

From the feedbacks received, Information of evacuated villages in the mock drill are listed below.

Table-5: Information of evacuated villages in the mock drill

Sl No.	Districts/ Organisation	What areas evacuated (name of the village/ town)	What time did the evacuation occur in each area (IST)	People were moved to	Number of people that evacuated in each area?
Andhra Pradesh					
1.	East Godavari	Konapapapeta (U.Kothapalli)	10:10	Relief Camp at ZP High School	91
2.	Guntur	Ramachandrapuram (Bapatla)	10:30	CARE public school, Maruproluvaripalem	450
3.	Krishna	Palakayatippa (Koduru)	09:50	Cyclone shelter & School, Koduru Village	500
4.	Nellore	Thulipalem	10:00	MPUP School	450
5.	Prakasam	Alagayapalem	10:05	Cyclone shelters.	212

6.	Srikakulam	Kundhuvanipeta	09:46	Cyclone shelters & Schools	530
7.	Visakhapatnam	Peda Jalaripeta, Peda Waltair (Vizag) and Chukkavanipalem (Bheemunipatnam)	10:02	KDPM High School and Cyclone shelter	1180
8.	Vizianagaram	Mukkam	10:00	Thotapalli Cyclone Shelter	1460
9.	West Godavari	Pedamainavani Lanka	10:02	New cyclone shelters at PM Lanka	189
Odisha					
1.	Balasore	63 coastal villages	10:00 - 11:30	Schools and Cyclone shelters	15185
2.	Bhadrak	41 coastal villages	10:00	Cyclone shelters	5000
3.	Ganjam	44 coastal villages	10:15 - 10:36	Cyclone shelters and high land areas	25625
4.	Jagatsinghpur	27 coastal villages	09:50 - 10:30	Cyclone shelters and high land areas	6750
5.	Kedrapada	64 coastal villages	11:30	Cyclone shelters and high land areas	67325
6.	Puri	89 coastal villages	10:30 - 11:00	Cyclone shelters and high land areas	21863
Tamil Nadu					
1.	Cuddalore	Nanjalingampettai (Cuddalore) and Chinnoor South (Bhuvanagiri)	10:35 AM	Multi-purpose Evacuation Shelters	376
2.	Kancheepuram	Kovalam, Paramankeni kuppam	10:40	Govt. School and Cyclone shelters	187
3.	Kanniyakumari	Rajakkamangalam thurai, Colachel	10:05	Multi-purpose Evacuation Shelters	130
4.	Nagapattinam	Keelaiyar (Sirkali), Vilunthamavadi (Kilvelur)	10:33	Multi-purpose Evacuation Shelters and community hall	425
5.	Thoothukudi	Palyakayal, Kayalpattinam (Kombuthurai)	10:27	Relief Shelters	298
6.	Tirunelveli	Kuttapanai of Kuttam (Radhapuram)	10:15	Relief Shelters	25
7.	Thiruvallur	Nakkathuravu (Ponneri), Methipalayam(Gummudi Poondi)	10:37 - 11:15	Govt. School and shelters	61

8.	Thiruvarur	Pudukudi (Thondiyakadu), Munankadu (Karpaganatharkulam)	10:10	Relief Camps	145
West Bengal					
1.	North 24 Parganas	Hemnagar (Hingalgunj)	09:30 - 13:00	High School	479
2.	Purba Medinipur	Mandarmoni (Ramnagar-I), Jaldha (Ramnagar-II), Soula (Contai-I)	10:00	Multipurpose community shelters	2625
3.	South 24 Parganas	Amarabati (Namkhana), Radhakrishnapur (Sagar), Khariberia (Budge Budge-I)	11:00 - 11:45	Flood centers	2151
				Total	**1,53,712**

From the evaluation forms received from all east coast states, it was observed that approximately 1,53,712 people were evacuated to safe places during mock drill. The level of participation was excellent compared with previous mock drills and IOWave Exercises conducted in India till now. However, the measure of success is determined by number of feedbacks received post-exercise. Though many agencies have sent report on time, INCOIS hasn't received feedbacks from few agencies yet. Hence, it should be noted the information requested through evaluation form used to assess each state's ability to receive and assess the tsunami warning messages, and to prepare and disseminate public notification. The failed response may give wrong interpretation on level of preparedness of respective state to the other participating agencies and/or national level agencies.

Recommendations:

- Conventionally, actions taken by the public are influenced by delivery methods because of the time it takes people to convert pre-warning perceptions into current perceptions of risk. Hence, it is vital to improve the preparedness at community level for positive impact on public response through effective mode of communication.
- In order to improve the response, proposed standards for outreach include a commendable list of potential activities, such as incorporating tsunami safety materials into public utility bills or conducting tsunami training programmes at schools, colleges.

5.6. Objective-6: Community preparedness

While tsunami detection and warning messages are the responsibility of the tsunami early warning centre, local and state officials are responsible for preparing communities for future tsunamis, issuing evacuation orders, and managing evacuations and response efforts. Community preparedness and emergency management of tsunamis are largely the responsibility of Disaster Management Agencies. It is well understood educating at-risk populations on how to prepare for future tsunamis and to react properly during an event is challenging for local officials because of the dynamic mix of residents, employees, and tourists in tsunami hazard zones. However, the mock drill witnessed the passion of disaster management officers in community tsunami preparedness activities. Based on evaluations received from DMOs, all state/district level offices have their own SOPs to deal with tsunami emergency. The huge community level involvement is the evidence of efforts made by DMOs at grassroots. It was observed that most of the organisations coordinated with stakeholders in their area including media during the event. Response time has significantly improved. Various modes of communications were used for alerting local communities and around 1,53,712 people were evacuated to shelters/safe places during the drill.

Recommendations:

- Conduct baseline assessments of readiness for all at-risk communities in order to discover whether at-risk individuals are able to recognize natural cues of tsunamis and to take self-protective actions
- Though it is difficult to assess whether awareness campaigns and educational efforts have any effect on changing the tsunami knowledge and preparedness of at-risk populations, it is observed through tsunami mock drills community awareness & preparedness can be assessed successfully. Hence, it is recommended to take active participation in mock drills regularly.
- The at-risk communities should be involved in preparation of hazard maps and tsunami evacuation route maps with the help of experts from DMOs or warning centre.
- It is very important to make tsunami awareness material as part of school curriculums. The other ways of educating public include display of information in fairs, festivals, communal places, religious places, hotels, distribution of brochures, newsletters to reach various audiences (children, adults, households, tourists etc) at different levels (villages, cities, tourist places etc.)

6. Overall Assessment of the drill

The majority of responding states and agencies that completed the evaluation forms expressed the positive view that multi-state mega mock tsunami drill planning and conduct successfully met the exercise objectives.

- That tsunami information dissemination was timely and methods used were effective - the majority of participating agencies expressed that this objective was successfully met.
- Although response was limited from few agencies, it appears that Objective 2 was met. Tsunami warning bulletins arrived by fax, email, or SMS. The email and SMS found to be most effective way of communication and fax found to be very poor.
- All lead agencies such as SEOCs were successful in disseminating tsunami warnings to their down level emergency services agencies such as district, local and block level, also to line departments who were involved in the drill. A wide variety of communication methods were used including fax, telephone, email, SMS, dedicated landlines, PAS, website, Public call centre, tom-tom, Door-to-Door, Sirens, TV, Social media (WhatsApp, etc.) and radio communications to reach the public. There was a positive response by participating agencies stating that the communication methods used and the timeliness of information issued was sufficient to support communication requirements. However, it was suggested to use satellite communication methods too in order to provide foolproof services.
- The majority of evaluations for Objective 3 were positive stating that this objective was met particularly in regards to the proven ability to assemble all stakeholders' management groups in a timely manner. The only comment made was that to optimize the Incident Response System. It was also observed that in most of the participating agencies, the media infrastructures already exist.
- The average elapsed time achieved from time of receipt of warning to activating the public notification systems was 30 minutes. This is great achievement compared with previous mock drills as it has substantially improved, though the involvement of communities was at huge level.
- The Tsunami mock drill was very successful which enhanced the awareness and preparedness among the coastal people of East Coast of India. The majority of the evaluations show that agencies necessitate regular tsunami mock drills at least once a year.

6.1. State-wise Summary

6.1.1. Andhra Pradesh

- All 9 districts of Andhra Pradesh (East Godavari, West Godavari, Guntur, Krishna, Nellore, Prakasam, Srikakulam, Visakhapatnam, Vizianagaram) participated in drill.
- As per feedbacks received around 5062 people from 11 villages participated in the mock drill from 9 coastal districts of Andhra Pradesh.
- The following are the villages from each district Konapapapeta (U.Kothapalli), Pedamainavani Lanka, Ramachandrapuram (Bapatla), Palakayatippa (Koduru), Thulipalem, Alagayapalem, Kundhuvanipeta, Peda Jalaripeta, Peda Waltair (Vizag), Chukkavanipalem (Bheemunipatnam) and Mukkam.
- Apart from DMOs, 10th Bn NDRF also submitted feedback and requested for conducting regular mock drills to improve the community preparedness.

Field Photos of Andhra Pradesh

Figure - 7: Mock drill photos of Andhra Pradesh

6.1.2. Odisha

- All 6 districts of Odisha (Balasore, Bhadrak, Ganjam, Jagatisinghpur, Kendrapada and Puri) participated in drill.
- As per feedbacks received around 1,41,748 people from 328 villages participated in the mock drill from 6 coastal districts of Odisha.
- Apart from DMOs, 3rd Bn NDRF also submitted feedback and requested for sending detailed bulletins through fax, instead just notification message. Also it was suggested to optimize the IRS team for better response and coordination
- The feedback from districts suggested for awareness campaigns and special training for village volunteers & NGOs.

Field Photos of Odisha

Figure - 8: Mock drill photos of Odisha

6.1.3 Puducherry

- 2 villages (Panithittur & Madhakadi) participated from Puducherry Union Territory
- It was observed that Puducherry DMOs haven't submitted the feedback.
- However, the 4th Bn NDRF participated actively and deployed their teams at Panithittu (Puducherry), Madakadi (Karaikkal), Orukuppam (Chennai) and Kovalam (Kanchepuram). Around 1274 people evacuated to tsunami relief shelters.
- As per feedback received from Puducherry they have requested for installation of tsunami signage along the coast of the state.

Field Photos of Puducherry

Figure - 9: Mock drill photos of Puducherry

6.1.4 Tamil Nadu

- Out of 13 costal districts from Tamil Nadu, all participated in tsunami mock drill. However, feedback is received only from Cuddalore, Kancheepuram, Kanniyakumari, Nagapattinum, Thoothukudi, Tirunelveli, Thiruvallur and Thiruvarur. The following districts haven't submitted feedback for evaluation: Chennai, Viluppuram, Tanjavur, Ramanathapuram, Pudukottai
- From each district, 2 coastal villages were participated in the tsunami mock drill
- As per the feedback received around 1647 participated in the mock drill from 8 (feedback submitted) coastal districts of Tamil Nadu
- From feedbacks received it was observed that most of the requests are for conducting regular drills at every tsunami-prone village.

Field Photos of Tamil Nadu

Figure - 10: Mock drill photos of Tamil Nadu

6.1.5 West Bengal

- All 3 coastal districts (North 24 Parganas, South 24 Paraganas and Purba Medinipur) of West Bengal participated in tsunami mock drill and the following are the villages from each district Hemnagar (Hingalgunj), Mandarmoni (Ramnagar-I), Jaldha (Ramnagar-II), Soula (Contai-I), Amarabati (Namkhana), Radhakrishnapur (Sagar), Khariberia (Budge Budge-I), 3 villages (Digha, Dwarirjangal and Kakdwip).
- Feedback was received from all districts. Large number of people took active participation in evacuating the areas and moving to safe zones.
- As per the feedback received around 5255 participated in the mock drill from 3 coastal districts of West Bengal
- It was suggested through feedbacks that satellite based emergency communication systems to be installed at vulnerable coasts in addition to conventional modes. Also, addressed about usage of social media such as whatsapp.

Field Photos of West Bengal

Figure - 11: Mock drill photos of West Bengal

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Appendix A: List of Coastal Districts and Village level participation in Exercise

S. No.	State	District	Village (Taluk/ Mandal)	No. of People Evacuated
1	Andhra Pradesh	East Godavari	Konapapapeta (U.Kothapalli)	91
2		Guntur	Ramachandrapuram (Bapatla)	450
3		Krishna	Palakayatippa (Koduru)	500
4		Nellore	Thulipalem	450
5		Prakasam	Alagayapalem	212
6		Srikakulam	Kundhuvanipeta	530
7		Visakhapatnam	Peda Jalaripeta, Peda Waltair (Vizag) and Chukkavanipalem (Bheemunipatnam)	1180
8		Vizianagaram	Mukkam	1460
9		West Godavari	Pedamainavani Lanka	189
10	Odisha	Balasore	63 coastal villages	15185
11		Bhadrak	41 coastal villages	5000
12		Ganjam	44 coastal villages	25625
13		Jagatisinghpur	27 coastal villages	6750
14		Kedrapada	64 coastal villages	67325
15		Puri	89 coastal villages	21863
16	Tamil Nadu	Chennai	Orurkuppam (Chennai)	
17		Cuddalore	Nanjalingampettai (Cuddalore) and Chinnoor South (Bhuvanagiri)	376
18		Kancheepuram	Kovalam, Paramankeni kuppam	187
19		Kanniyakumari	Rajakkamangalam thurai, Colachel	130
20		Nagapattinam	Keelaiyar (Sirkali), Vilunthamavadi (Kilvelur)	425
21		Pudukottai		
22		Ramanathapuram		
23		Thanjavur		
24		Thoothukudi	Palyakayal, Kayalpattinam (Kombuthurai)	298
25		Tirunelveli	Kuttapanai of Kuttam (Radhapuram)	25
26		Thiruvallur	Nakkathuravu (Ponneri), Methipalayam(Gummudi Poondi)	61
27		Thiruvarur	Pudukudi (Thondiyakadu), Munankadu (Karpaganatharkulam)	145
28		Viluppuram		
29	Puducherry	Puducherry	Panithittur (Puducherry), Madhakadi (Karaikal)	
30	West Bengal	North 24 Parganas	Hemnagar (Hingalgunj)	479
31		Purba Medinipur	Mandarmoni (Ramnagar-I), Jaldha (Ramnagar-II), Soula (Contai-I)	2625
32		South 24 Parganas	Amarabati (Namkhana), Radhakrishnapur (Sagar), Khariberia (Budge Budge-I)	2151

Out of 32, feedback received only from 26 districts. Feedback not received from Chennai, Pudukottai, Ramanathapuram, Thanjavur, villupuram and Puducherry districts.

Note: In addition to above district list, messages sent to all east coast State Emergency Operation Centres (SEOC) and NDRFs (2^{nd} Bn, 3^{rd} Bn, 4^{th} Bn and 10^{th} Bn), Navy (HQENC) and Coast Guards.

Appendix B: Summary of Email messages received by the recipients

Bulletins / Districts/Organisations	0930 Test Start	0935 B1	0945 B2	1000 B3	1030 B4	1130 B5	1230 B6	1330 B7
East Godavari, AP	0932	0935	0946	1001	1032	1131	1233	1331
Guntur, AP	0932	0936	0946	1001	1048	1155	1246	1330
Krishna, AP	0932	0934	0946	1000	1030	1131	1231	1331
Nellore, AP	0930	0935	0946	1000	1030	1133	1231	1330
Prakasam, AP	0932	0938	0946	1001	1032	1131	1231	1331
Srikakulam, AP	0930	•	0946	1028	1036	1131	1230	1331
Visakhapatnam, AP	•	0935	0945	1000	1030	1130	1230	1330
Vizianagaram, AP	0933	0938	0949	•	•	•	•	•
West Godavari, AP	0930	0935	0945	1000	1031	1131	1231	1330
SEOC, AP	0930	0935	0945	1000	1030	1130	1230	1330
Balasore, OD	0930	0935	0945	1000	1030	1130	1230	1330
Bhadrak, OD	0931	0935	0945	1000	1031	1130	1230	1330
Ganjam, OD	0931	0936	0946	1001	1031	1131	1231	1331
Jagatsinghpur, OD	0930	0934	0945	1000	1033	1134	1230	1331
Kedrapada, OD	0931	0935	0945	1000	1030	1130	1231	1329
Puri, OD	0930	0935	0945	1000	1030	1130	1230	1330
SEOC, OD	0930	0935	0945	1000	1030	1130	1230	1330
Cuddalore, TN	•	0936	0949	1001	1033	1131	1232	1331
Kancheepuram, TN	0930	0934	0945	1000	1031	1130	1230	1330
Kanniyakumari, TN	0930	0935	0948	1002	1033	1132	1233	1331
Nagapattinam, TN	0933	0936	0949	1001	1033	1131	1232	1331
Thoothukudi, TN	0930	0934	0945	1000	1031	1130	1230	1330
Tirunelveli, TN	0931	0934	0945	1000	1030	1130	1230	1330
Thiruvallur, TN	•	0935	•	•	1054	•	•	•
Thiruvarur, TN	0931	0937	0945	1000	1030	1130	1230	1330
North 24 Parganas, WB	•	•	•	•	•	•	•	•
Purba Medinipur, WB	0932	0936	0948	1000	1037	1131	1231	1330
South 24 Parganas, WB	0930	0936	0945	1001	1032	1132	1235	1332
SEOC, WB	0930	0935	0945	1000	1030	1130	1230	1330
NDRF 3rd Battalion, OD	•	0935	0946	1000	1030	1130	1230	1330
NDRF 4th Battalion, TN/PD	0930	0934	0946	1000	1030	1130	1230	1330
NDRF 10th Battalion, AP	0930	0934	0945	1002	1030	1130	1230	1330
Navy-HQENC	0930	0935	1000	1003	1030	1130	1230	1330
Coast Guards	0930	0935	0945	1000	1030	1131	1231	1330

Note: Above table indicates list of Feedback received from various Districts, SEOC, NDRF Battalions, Navy and Coast Guards.

(AP- Andhra Pradesh; OD- Odisha ; PD- Puducherry; TN- Tamil Nadu and WB- West Bengal)

Appendix C: Summary of Fax messages received by the recipients

Bulletins / Districts/Organisations	0930 Test Start	0935 B1	0945 B2	1000 B3	1030 B4	1130 B5	1230 B6	1330 B7
East Godavari, AP	•	•	•	•	•	•	•	•
Guntur, AP	•	•	•	•	•	•	•	•
Krishna, AP	•	•	•	•	•	•	•	•
Nellore, AP	•	•	•	•	•	•	•	•
Prakasam, AP	0931	0936	0948	1007	1030	1140	1234	1336
Srikakulam, AP	•	•	•	•	•	•	•	•
Visakhapatnam, AP	•	•	•	•	•	•	•	•
Vizianagaram, AP	•	•	•	•	•	•	•	•
West Godavari, AP	•	•	•	•	•	•	•	•
SEOC, AP	•	•	•	•	•	•	•	•
Balasore, OD	•	•	•	•	•	•	•	•
Bhadrak, OD	•	•	•	•	•	•	•	•
Ganjam, OD	•	•	•	•	•	•	•	•
Jagatsinghpur, OD	•	•	•	•	•	•	•	•
Kedrapada, OD	0931	0935	0945	1000	1031	1131	1231	1330
Puri, OD	•	•	•	•	•	•	•	•
SEOC, OD	•	•	•	•	•	•	•	•
Cuddalore, TN	0935	0940	0950	1002	1031	1131	1231	1339
Kancheepuram, TN	•	0940	0955	1010	1045	1135	1245	1335
Kanniyakumari, TN	0930	0938	0950	1001	•	1142	1235	1335
Nagapattinam, TN	0937	0938	0951	1000	1029	1130	1230	1330
Thoothukudi, TN	•	•	1000	1022	1032	1132	•	1332
Tirunelveli, TN	0930	0935	0948	1000	1030	1130	1230	1330
Thiruvallur, TN	0930	•	0945	1000	1030	1130	1230	1330
Thiruvarur, TN	0931	0937	•	1001	•	1140	•	•
North 24 Parganas, WB	•	•	•	•	•	•	•	•
Purba Medinipur, WB	•	•	•	•	•	•	•	•
South 24 Parganas, WB	•	•	•	•	•	•	•	•
SEOC, WB	0930	0935	0945	1000	1030	1130	1230	1330
NDRF 3rd Battalion, OD	•	•	•	•	•	•	•	•
NDRF 4th Battalion, TN/PD	1020	1020	1021	1022	1100	1200	1240	•
NDRF 10th Battalion, AP	0930	0934	0945	1002	1030	1131	1230	1331
Navy-HQENC	0932	0937	0947	1001	1031	1134	1234	1331
Coast Guards	•	•	•	•	•	•	•	•

Note: Above table indicates list of Feedback received from various Districts, SEOC, NDRF Battalions, Navy and Coast Guards.

(AP- Andhra Pradesh; OD- Odisha ; PD- Puducherry; TN- Tamil Nadu and WB- West Bengal)

Appendix D: Summary of SMS messages received by the recipients

Bulletins / Districts/Organisations	0930 Test Start	0935 B1	0945 B2	1000 B3	1030 B4	1130 B5	1230 B6	1330 B7
East Godavari, AP	0932	0935	0946	1001	1032	1131	1233	1331
Guntur, AP	•	•	•	•	•	•	•	•
Krishna, AP	0932	0936	0947	1001	1030	1131	1232	1332
Nellore, AP	0930	0935	0946	1000	1030	1133	1231	1330
Prakasam, AP	0931	0936	0945	1007	1033	1149	1243	1330
Srikakulam, AP	0930	•	0957	1028	1036	1135	1235	1333
Visakhapatnam, AP	•	0935	0945	1000	1030	1130	1230	1330
Vizianagaram, AP	0933	0940	0948	1001	1032	1131	1233	1335
West Godavari, AP	0930	0935	0945	•	1031	1131	1231	1330
SEOC, AP	0930	0935	0945	1000	1030	1130	1230	1330
Balasore, OD	•	•	•	•	•	•	•	•
Bhadrak, OD	0931	0935	0945	1000	1031	1130	1230	1330
Ganjam, OD	0931	0936	0946	1001	1031	1131	1231	1331
Jagatsinghpur, OD	0930	0935	0950	1000	1035	1135	1230	1331
Kedrapada, OD	0930	0940	0945	1000	1036	1130	1230	1330
Puri, OD	•	•	•	•	•	•	•	•
SEOC, OD	0930	0935	•	1000	1031	•	1230	1330
Cuddalore, TN	•	•	•	•	•	•	•	•
Kancheepuram, TN	0933	0935	0946	1001	1031	1132	1234	1333
Kanniyakumari, TN	0930	0935	•	•	•	•	•	1337
Nagapattinam, TN	0933	0936	0949	1001	1033	1130	1233	1331
Thoothukudi, TN	•	•	•	•	•	•	•	•
Tirunelveli, TN	0930	0934	0945	1000	1030	1130	1230	1330
Thiruvallur, TN	•	•	•	•	•	•	•	•
Thiruvarur, TN	0931	0935	•	1000	1031	1130	1230	1330
North 24 Parganas, WB	0930	0934	0945	1000	1030	1130	1230	1330
Purba Medinipur, WB	0932	0936	0948	1000	1037	1131	1231	1330
South 24 Parganas, WB	0932	0937	0947	1003	1033	1134	1235	1332
SEOC, WB	0930	0935	0945	1000	1030	1130	1230	1330
NDRF 3rd Battalion, OD	•	•	•	•	•	•	•	•
NDRF 4th Battalion, TN/PD	0931	0935	1031	1000	•	1134	1230	1350
NDRF 10th Battalion, AP	0930	0934	0945	1002	1031	1131	1230	1330
Navy-HQENC	•	•	•	1003	1031	1130	1230	1330
Coast Guards	0934	0939	0949	1004	1037	1135	1235	1335

Note: Above table indicates list of Feedback received from various Districts, SEOC, NDRF Battalions, Navy and Coast Guards.

(AP- Andhra Pradesh; OD- Odisha ; PD- Puducherry; TN- Tamil Nadu and WB- West Bengal)

Appendix E: Summary of INCOIS Website access by each recipient

Bulletins / Districts/Organisations	0935 B1	0945 B2	1000 B3	1030 B4	1130 B5	1230 B6	1330 B7
East Godavari, AP	N	N	N	N	N	N	N
Guntur, AP	Y	Y	Y	Y	Y	Y	Y
Krishna, AP	Y	Y	Y	Y	Y	Y	Y
Nellore, AP	Y	Y	Y	Y	Y	Y	Y
Prakasam, AP	Y	Y	Y	Y	Y	Y	Y
Srikakulam, AP	Y	Y	Y	Y	Y	Y	Y
Visakhapatnam, AP	Y	Y	Y	Y	Y	Y	Y
Vizianagaram, AP	Y	Y	Y	Y	Y	Y	Y
West Godavari, AP	Y	Y	Y	Y	Y	Y	Y
SEOC, AP	Y	Y	Y	Y	Y	Y	Y
Balasore, OD	Y	Y	Y	Y	Y	Y	Y
Bhadrak, OD	Y	Y	Y	Y	Y	Y	Y
Ganjam, OD	Y	Y	Y	Y	Y	Y	Y
Jagatsinghpur, OD	Y	Y	Y	Y	Y	Y	Y
Kedrapada, OD	Y	Y	Y	Y	Y	Y	Y
Puri, OD	Y	Y	Y	Y	Y	Y	Y
SEOC, OD	Y	Y	Y	Y	Y	Y	Y
Cuddalore, TN	Y	Y	Y	Y	Y	Y	Y
Kancheepuram, TN	Y	Y	Y	Y	Y	Y	Y
Kanniyakumari, TN	Y	Y	Y	Y	Y	Y	Y
Nagapattinam, TN	Y	Y	Y	Y	Y	Y	Y
Thoothukudi, TN	Y	Y	Y	Y	Y	Y	Y
Tirunelveli, TN	Y	Y	Y	Y	Y	Y	Y
Thiruvallur, TN	N	Y	Y	Y	Y	Y	Y
Thiruvarur, TN	Y	Y	Y	Y	Y	Y	Y
North 24 Parganas, WB	Y	Y	Y	Y	Y	Y	Y
Purba Medinipur, WB	Y	Y	Y	Y	Y	Y	Y
South 24 Parganas, WB	Y	Y	Y	Y	Y	Y	Y
SEOC, WB	Y	Y	Y	Y	Y	Y	Y
NDRF 3rd Battalion, OD	Y	Y	Y	Y	Y	Y	Y
NDRF 4th Battalion, TN/PD	Y	Y	Y	Y	Y	Y	Y
NDRF 10th Battalion, AP	Y	Y	Y	Y	Y	Y	Y
Navy-HQENC	Y	Y	Y	Y	Y	Y	Y
Coast Guards	Y	Y	Y	Y	Y	Y	Y

Note: Above table indicates list of Feedback received from various Districts, SEOC, NDRF Battalions, Navy and Coast Guards.

(AP- Andhra Pradesh; OD- Odisha ; PD- Puducherry; TN- Tamil Nadu and WB- West Bengal)

Appendix F: Summary of Feedbacks received from participated Districts/organisations:

S. No	Location	Receipt of Notifications from INCOIS (Email, SMS, Fax)	Do you have a formal SOP for tsunami response	What actions were taken after receiving messages	Did your organization issue tsunami warning messages to public	Assessment of the elapsed time until the public were notified	Evacuated areas details	Whether the drill contributed to the improvement of planning related to public warnings	Remarks
1	East Godavari, Andhra Pradesh	Email, SMS	Yes	Message pass on to all line departments, NGOs, Local Public Alerted at 9:37AM	Yes. By Telephone, SMS, Website, Sirens, PAS, Police, Door-to-door, Hand held mike and drum	6 minutes	Konapapapeta Village, U. Kothapalli Mandal at 10:10 AM. 91 people evacuated to Relief Camp at ZP High School	Yes. It is highly useful and may be extended to other areas also	Frequent mock drill to be required
2	Guntur, Andhra Pradesh	Email	Yes	Message pass on to all line departments, Local Public Alerted at 09:46 AM	Yes. By Telephone, TV, PAS, Police, Door-to-door and Media	15 minutes	Ramachandrapuram village, Bapatla Mandal at 10:30 AM. 450 people evacuated to CARE public school, Maruproluvaripalem.	Yes. The event went on very peaceful, successful and satisfaction mode.	All the line departments participated actively.
3	Krishna, Andhra Pradesh	Email, SMS	Yes	Message pass on to all line departments, Local ground level agencies Alerted at 09:46 AM	Yes. By Telephone, SMS, TV, Website, Siren, PAS, Public call centre, Police, Door-to-door and Tom-Tom	60 minutes	Palakayatippa village, Koduru mandal at 09:50 AM. 500 people evacuated to Cyclone shelter & School, Koduru Village	Yes. The mock drill is conducted successfully	By forming teams at village level to impart training and to create awareness will serve the purpose of these Mock Drills.
4	Nellore, Andhra Pradesh	Email, SMS	Yes	Alert the all line departments by beat of Tom-tom at 09:45 AM and Evacuated people at 10:00 AM	Yes. By Telephone, SMS, Public Radio, TV, Website, Siren, PAS, Public call centre, Police, Door-to-door and Tom-Tom	17 minutes	Thulipalem village at 10:00 AM. Total 450 people evacuated to MPUP School.	Yes	More awareness about tsunamis to be created among the public.
5	Prakasam, Andhra Pradesh	Email, Fax, SMS	Yes	Alerted the villagers at 9:38 AM	Yes. By Telephone, SMS, Public Radio, TV, Siren, PAS, Police, Door-to-door and Tom-Tom	15 minutes	Alagayapalem at 10:05 AM. Total 212 people evacuated to cyclone shelters.	Yes. This is real time exercise which creates awareness to the people.	Providing training to some selected local people in coastal villages.

6	Srikakulam, Andhra Pradesh	Email, SMS	Yes	Messages communicated to local ground level agencies at 10:05 AM	Yes. By Telephone, SMS, TV, Siren, PAS, Public call centre, Police, Door-to-door	60 minutes	Kundhuvanipeta at 09:46 AM. Total 530 people evacuated to cyclone shelters & Schools.	Yes. The mock drill is successful event.	The mock drill creates awareness among the public as well as develops strong mind to face any eventually during the disasters
7	Visakhapatnam, Andhra Pradesh	Email, SMS	Yes	Informed to all the offices and announcement has been done by beat of Tom Tom in the Village at 09:37 AM	Yes. By Telephone, SMS, Siren, PAS, Police, Door-to-door and tom-tom	30 minutes	Peda Jalaripeta, Peda Waltair and Chukkavanipalem at 10:02 AM. Total 1180 people evacuated to KDPM High School and Cyclone Shelter.	Yes	-
8	Vizianagaram, Andhra Pradesh	Email, SMS	Yes	Messages forwarded line departments by 10:00 AM	Yes. By SMS, TV, Website, Siren, PAS, Police and Door-to-door	10 minutes	Mukkam village at 10:00 AM. Total 1460 people evacuated to Thotapalli Cyclone Shelter	Yes	-
9	West Godavari, Andhra Pradesh	Email, SMS	Yes	Alerted the line departments and public to watch and be prepared for evacuation at 09:46 AM	Yes. By SMS, Siren, PAS, Police, Door-to-door and through mike sets from temples and churches	2 minutes	Pedamainavani Lanka village at 10:02 AM. Total 189 people evacuated to new cyclone shelters at PM Lanka	Yes. The mock drill was contribuated very much on understading the tsunami bulletins for preparedness	Public may be more sensitized before mock drill through pamphlets, self help group, public general meetings, etc.
10	SEOC, Andhra Pradesh	Email, SMS	Yes	Disseminated information to all 9 coastal distracts	Yes. By Telephone, SMS, TV, Siren, PAS, Public call centre, Police and Door-to-door	< 30 minutes	Around 5062 people evacuated to safe placed in 9 districts	Yes. It is very useful and conducting more capacity building activities on disaster related it will be easy and smooth way to handling the evacuation.	The forms have been sent to DEOC, MEOC and on ground report, Post evaluation form, and a bulletin board. This as one of the best method for communication apart from E-mail, SMS, fax, and phone call, Ham Radio, VHF-SET, V-Sat and Video Call.
11	Balasore, Odisha	Email	Yes	Disseminated messages to all line	Yes. By Telephone, SMS, Siren, PAS, Police,	40 minutes	63 coastal villages during 10:00 - 11:30 AM. Around 15185 people	Yes. Strong preparedness and awareness	Required more number of evacuation trainings for

				departmen ts	Door-to-door and village volunteers		evacuated to schools and cyclone shelters	has created.	community members, village volunteers and NGOs
12	Bhadrak,Od isha	Email, SMS	No. Will be develope d shortly	Disseminat ed messages to all line departmen ts	Yes.	13 minutes	41 coastal villages at 10:00 AM. Around 5000 people evacuated to cyclone shelters	Yes.	Future drill will be improved through activation of siren towers, preparation of road maps and implementation of IRS
13	Ganjam, Odisha	Email, SMS	Yes	Disseminat ed messages to all line departmen ts	Yes. By Telephone, SMS, TV, Website, Siren, PAS, Police and Door-to-door	27 minutes	44 coastal villages during 10:15 - 10:36 AM. Around 25625 people evacuated to cyclone shelters and high land areas	Yes.	Massive awareness campaign should be done to aware public regarding the pros and coins of tsunamis
14	Jagatsinghp ur, Odisha	Email, SMS	Yes	Disseminat ed messages to all line departmen ts	Yes. By Siren, PAS, Police and Door-to-door	60 minutes	27 coastal villages during 09:50 - 10:30 AM. Around 6750 people evacuated to cyclone shelters and high land areas	Yes	Extensive training to all officials, volunteers and NGOs prior to the mock drill is highly needed.
15	Kedrapada, Odisha	Email, SMS, Fax	Yes. Defined in the DDMP	Disseminat ed messages to all line departmen ts	Yes. By Telephone, SMS, Public Radio, Siren, PAS, Police and Door-to-door	6 minutes	64 coastal villages at 11:30 AM. Around 67325 people evacuated to cyclone shelters and high land areas	Yes. It will improve by awareness training	Ii may be enhanced by advance training.
16	Puri, Odisha	Email	Yes. Defined in the DDMP	Disseminat ed messages to all line departmen ts	Yes. By Telephone, SMS, Siren, PAS, Police, Door-to-door and village level volunteers	40 minutes	89 coastal villages during 10:30 - 11:00 AM. Around 21863 people evacuated to cyclone shelters and high land areas	Yes	Required more numbers of evacuation trainings for community members, village volunteers and NGOs
17	SEOC, Odisha	Email, SMS	Yes	Disseminat ed timely messages to all 6 coastal districts	Yes. To District level by Email, Fax, SMS, Social media	20 minutes	All 6 costal distract of 328 villages participated in the mock drill. Around 1,56,679 people evacuated to cyclone shelters and high land areas	Yes. Regular tsunami awareness activities should be conducted in all vulnerable areas throughout the year.	It is suggested that though the bulletin contains only few pages, some mechanisms could be developed for sending the same directly by fax in time. The IRS needs to be implemented optimally for

									better response and coordination.
18	Cuddalore, Tamil Nadu	Fax, Email	Yes	Disseminated messages to all line departments and Hospitals	Yes. By TV, PAS and public Radio	-	Nanjalingampettai and Chinnoor villages at 10:35 AM. 376 people evacuated to Multi-purpose Evacuation Shelters	Yes. The drill has contributed more to improve current existing pattern, dissemination of information, planning for staging place and mobilization of team	IRS may be incorporated in our dissemination structure. Frequent dills and awareness programmes to be required. Permanent setup of Disaster Managemnet FM Radio with effective frequency modulation.
19	Kancheepuram, Tamil Nadu	Email, SMS, Fax	Yes	Disseminated messages to all line departments	Yes. By Telephone, SMS, Public Radio, TV, Website, Siren, PAS, Public call centre, Police and Door-to-door	17 minutes	Kovalam, Paramankeni kuppam villages at 10:40 AM. 187 people evacuated to Govt School and Cyclone shelters	Yes	Future drill will be improved by using social networking and other mode of communication to reduce the lapse time.
20	Kanniyakumari, Tamil Nadu	Email, SMS, Fax	Yes	Disseminated messages to all line departments	Yes. By SMS, Public Radio, Siren, PAS, Police, Door-to-door, Whatapp groups, Fire service, Bells.	20 minutes	Rajakkamangalam thurai, Colachel villages at 10:05 AM. 130 people evacuated to Multi-purpose Evacuation Shelters	Yes	Similar drill must be carried out at each villages which are vulnerable for tsunamis.
21	Nagapattinam, Tamil Nadu	Email, SMS, Fax	Yes	Disseminated messages to all line departments	Yes. By Telephone SMS, Public Radio, Siren, PAS, Police, Door-to-door and Whatapp groups	75 minutes	Keelaiyar, Vilunthamavadi villages at 10:33 AM. 425 people evacuated to Multi-purpose Evacuation Shelters and community hall	Yes. It helped in ensuring timely dissemination and improve planning in issuing public warning and response activities	Required more public participation.
22	Thoothukudi, Tamil Nadu	Email, Fax	Yes	Disseminated messages to all line departments	Yes. By Siren, PAS, Police, Door-to-door and Whatapp groups	15 minutes	Palyakayal, Kayalpattinam villages at 10:27 AM. 298 people evacuated to Relief Shelters	Yes. All departments should be work together	The drill to be conducted in regular basis. Specific actions need to be briefed for mock drill during tabletop exercise.
23	Tirunelveli, Tamil Nadu	Email, SMS, Fax	Yes	Disseminated messages to all line departmen	Yes. By Siren, PAS, Police, Door-to-door and Whatapp groups	15 minutes	Kuttapanai of Kuttam village at 10:15 AM. 25 people evacuated to Relief Shelters	Yes. The drill was contributed to improvement	The mock drills may be continued for every year. The mock drill

				ts				in public awareness	documentation should be disseminated to all line departments. Village volunteer network should be institutionalized and frequent trainings to be conducted.
24	Thiruvallur, Tamil Nadu	Email, Fax	Yes	Disseminated messages to all line departments	Yes. By Sirens, PAS, Police and Door-to-door	100 minutes	Nakkathuravu, Methipalayam villages at 11:15 and 10:37 AM respectively. 61 people evacuated to Govt. School and shelters	Yes.	Future drill will be improved through Police Rescue team
25	Thiruvarur, Tamil Nadu	Email, SMS, Fax	Yes	Disseminated messages to all line departments	Yes. By SMS, Siren, PAS, Police, Door-to-door and Whatapp groups	14 minutes	Pudukudi, Munankadu villages at 10:10 AM. 145 people evacuated to Relief Camps	Yes.	The Visual media may be centrally coordinated to disseminate the information. Local jurisdictional Police may be alerted directly to minimize the time lapse for evacuation
26	North 24 Parganas, West Bengal	SMS	Yes	Disseminated messages to all line departments	Yes. By Telephone, SMS, Public Radio, Siren, PAS, Police, Door-to-door and Wall writing	60 minutes	Hemnagar village at 09:30 -13:00 hrs. 479 people evacuated to High School	Yes. After the mock drill, the line department was debriefed and faults, area of betterment was discussed.	More Awareness programs to be organised regularly. More emphasis is required on the technical and communication part in remote/isolated places
27	Purba Medinipur, West Bengal	Email, SMS	Yes	Disseminated messages to all line departments	Yes. By Telephone, SMS, Public Radio, Siren, PAS, Police and Door-to-door	20 minutes	Mandarmoni, Jaldha, Soula villages at 10:00 AM. 2625 people evacuated to Multipurpose community shelters	Yes.	Satellite based emergency communication may be installed in coastal areas which will helpful in case of conventional modes found defunct.
28	South 24 Parganas, West Bengal	Email, SMS	Yes	Disseminated messages to all line departmen	Yes. By Telephone, SMS, Public Radio, TV, Website, Siren,	19 minutes	Amarabati, Radhakrishnapur, Khariberia villages during 11:00 - 11:45 AM. 2151	Yes	More public may be participated in future drills.

				ts	PAS, Police and Door-to-door		people evacuated to flood centres		
29	SEOC, West Bengal	Email, SMS, Fax	Yes	Disseminated messages to all coastal districts	Yes. By Telephone, SMS, Public Radio, TV, Website, Siren, PAS, Public call centre, Police and Door-to-door	21 minutes	7 coastal villages from 3 districts participated. 5255 people move to Multipurpose community shelters	Yes. it helped to identify the gaps and improved the skills of allied agencies and coordination among them	1. INCOIS Warning should be followed by a call back to ascertain to receipt of the information. 2. INCOIS should also start using Social media (likeWhatapp) 3. INCOIS bulletin formats are very verbose and need to be curtailed to some extent. 4. The drills to be organised annually and more block level participation is required 5. IRS needs to be institutionalized more rigorously at the block level.
30	NDRF 3rd Battalion, Odisha	Email	Yes	As per instructions of the SEOC/DEOC, Odisha	Yes. By PAS, Door-to-door	15 minutes	Deployed the teams at Baripada (Balasore), Eram (Bhadrak), Manjulapalli (Kedrapada), PPL - Paradeep (Jagatsinghpur), Jaysree Chemical (Ganjam) villages of 5 costal district of Odisha. Around 894 people evacuated to Cyclone shelters	Yes. The mock exercise provides real time insight to the Tsunami threat, increases awareness among public, Do's & Don't etc	1. Tsunami warning siren code devices are installed and linked with ITEWS and Required to be equated with various siren codes by the inhabitants. 2. Required more awareness and preparedness programs 3. Still need of improvement on coordination among the various stakeholders and regularly trained/oriented on their role and responsibilities .
31	NDRF 4th Battalion, Tamil Nadu and Puducherry	Email, SMS, Fax	Yes	As per instructions of the SEOC/DEOC, Tamil Nadu and	Yes. By Telephone, SMS, Sirens, PAS and Door-to-door	-	Deployed teams at Panithittu (Puducherry), Madakadi (Karaikkal), Orukuppam	Yes. With the co-ordination from the local district administration.	Regular warning and public announcemnet system and evacuation training may

				Puducherry			(Chennai) and Kovalam (Kanchepuram). Around 1274 people evacuated to tsunami relief shelters		provided to public and proper signage may be put in evacuation routes.
32	NDRF 10th Battalion, Andhra Pradesh	Email, SMS, Fax	Yes	As per instructions of the SEOC/DEOC, Andhra Pradesh	Yes. By Telephone, Siren, Police and Mega phone	30 minutes	Deployed teams at Pedajjalarpeta, Chukkavanipalem, (Visakhapatnam), Ramchandrapuram (Guntur) . Around 1150 people evacuated to safe places of inland	Yes.	Such type of exercise should be frequent to make enable all the stakeholder as well as civilians to perform action during Tsunami.
33	Navy-HQENC	Email, SMS, Fax	Yes	To own Naval Community and the adjoining areas through own communication lines	NA	NA	NA	Yes.	-
34	Coast Guards	Email, SMS	Yes	Information passed to all units under the command	NA	NA	Deployed teams in West Bengal and Odisha. Around 800 people evacuated from Frazerganj, Bakkhali, Laxmipur to tsunami shelters	Yes.	Need to be improved communication between DEOC and other agencies including promulgation/periodic validation of contact details

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